WHAT IS CLAIMED IS:

1. A nanotube ink comprising a suspension of carbon nanotubes, wherein the carbon nanotubes are operable for undergoing photoluminescence and yielding emission within a pre-determined range of wavelengths when irradiated with radiation in the visible region of the EM spectrum, and wherein the nanotube ink is formulated for adhesion to a substrate surface when such a surface is printed with said nanotube ink.
2. The nanotube ink of Claim 1, wherein the carbon nanotubes are selected from the group consisting of single-wall carbon nanotubes, multi-wall carbon nanotubes, double-wall carbon nanotubes, and combinations thereof.
3. The nanotube ink of Claim 1, wherein the carbon nanotubes comprise single-wall carbon nanotubes.
4. The nanotube ink of Claim 1, wherein the carbon nanotubes comprise nanotubes having diameters less than about 3 nm.
5. The nanotube ink of Claims 1-3, or 4, wherein the carbon nanotubes within the nanotube ink are substantially homogeneous with respect to their photoluminescence properties.
6. The nanotube ink of Claims 1-3, or 4, wherein the carbon nanotubes within the nanotube ink comprise an artificially-generated population of single-wall carbon nanotubes of different nanotube species, such artificial generation provided by carbon nanotube separation techniques.
7. The nanotube ink of Claims 1-3, or 4, wherein the suspension comprises a liquid medium selected from the group consisting of water, organic solvents, supercritical fluids, and combinations thereof.
8. The nanotube ink of Claim 7, wherein the suspension further comprises surfactant.
9. The nanotube ink of Claims 1-7, or 8 further comprising an additive selected from the group consisting of traditional fluorescent inks, dyes, binders, polymeric material, nanoparticles, magnetic materials, and combinations thereof.

10. The nanotube ink of Claims 1-8, or 9, wherein the pre-determined range of wavelengths are in the near infrared.

11. A composition comprising:

a) a substrate; and

b) a plurality of carbon nanotubes in contact with said substrate, wherein said carbon nanotubes are operable for undergoing photoluminescence at a pre-determined range of wavelengths, and wherein the carbon nanotubes are part of a dried nanotube ink formulation, said nanotube ink formulated to adhere to the substrate in its dry state.

12. The composition of Claim 11, wherein the carbon nanotubes are selected from the group consisting of single-wall carbon nanotubes, multi-wall carbon nanotubes, double-wall carbon nanotubes, and combinations thereof.

13. The composition of Claim 11, wherein the carbon nanotubes comprise single-wall carbon nanotubes.

14. The composition of Claim 11, wherein the carbon nanotubes comprise nanotubes having diameters less than about 3 nm.

15. The composition of Claims 11-13, or 14, wherein the substrate comprises a fibrous material.

16. The composition of Claim 15, wherein the fibrous material is selected from the group consisting of paper, synthetic polymers, cotton, silk, and combinations thereof.

17. The substrate of Claims 11-13, or 14, wherein the substrate is a security.

18. The composition of Claims 11-13, or 14, wherein the substrate is currency.

19. A method for contacting a nanotube ink with a substrate comprising the steps of:

a) selecting a substrate;

b) selecting a nanotube ink comprising a suspension of carbon nanotubes in a liquid medium, wherein the carbon nanotubes have pre-determined photoluminescence properties, and wherein the suspension is formulated as an ink;

c) applying said nanotube ink to said substrate; and

d) removing the liquid medium from the nanotube ink to leave a dried nanotube ink in contact with the substrate.

20. The method of Claim 19, wherein the carbon nanotubes are selected from the group consisting of single-wall carbon nanotubes, multi-wall carbon nanotubes, double-wall carbon nanotubes, and combinations thereof.

21. The method of Claim 19, wherein the carbon nanotubes comprise nanotubes having diameters less than about 3 nm.

22. The method of Claims 19-20, or 21, wherein the substrate is a fibrous material selected from the group consisting of paper, synthetic polymers, cotton, silk, and combinations thereof.

23. The method of Claims 19-20, or 21, wherein the substrate is currency.

24. The method of Claims 19-22, or 23, wherein the photoluminescence properties are pre-determined qualitatively.

25. The method of Claims 19-22, or 23, wherein the photoluminescence properties are pre-determined quantitatively.

26. The method of Claims 19-24, or 25, wherein the liquid medium is selected from the group consisting of water, organic solvents, supercritical fluids, and combinations thereof.

27. The method of Claims 19-25, or 26, wherein the suspension further comprises a surfactant.

28. The method of Claims 19-26, or 27, wherein the suspension further comprises an additive selected from the group consisting of traditional inks, fluorescent inks, dyes, binders, polymeric material, nanoparticles, magnetic materials, and combinations thereof.

29. The method of Claims 19-27, or 28, wherein the step of applying said nanotube ink to said substrate comprises an application method selected from the group consisting of ink spraying, ink jet printing, flowing ink pen transfer, stamping, and combinations thereof.

30. The method of Claims 19-28, or 29, wherein the liquid medium is removed by an evaporative technique.

31. A method comprising the steps of:

a) selecting a composition comprising (i) a substrate and (ii) a plurality of carbon nanotubes in contact with said substrate, wherein said carbon nanotubes are operable for undergoing photoluminescence at a pre-determined range of wavelengths;

b) irradiating the composition with radiation of a range of wavelengths; and

c) detecting luminescence emission at corresponding first van Hove wavelengths in the near infrared.

32. The method of Claim 31, wherein the carbon nanotubes are selected from the group consisting of single-wall carbon nanotubes, multi-wall carbon nanotubes, double-wall carbon nanotubes, and combinations thereof.

33. The method of Claim 31 or 32, wherein the step of irradiating is done with radiation of a range of wavelengths which match second, third, or higher van Hove optical transitions within the carbon nanotubes.

34. The method of Claim 31 or 32, wherein the step of irradiating is done with radiation of a range of wavelengths which match the plasmon resonance optical transitions within the carbon nanotubes.

35. The method of Claims 31-33, or 34, wherein the detecting step is carried out by a process selected from the group consisting of near-infrared camera detection, spectral filtering, and combinations thereof.

36. The method of Claim 35, wherein the near-infrared camera detection comprises the use of a camera selected from the group consisting of an InGaAs camera, a Si camera, and combinations thereof.

37. The method of Claims 31-35, or 36, wherein (a) the substrate is selected from the group consisting of genuine securities, counterfeit securities, and combinations thereof and (b) said method provides a mechanism in which to distinguish whether the substrate is a genuine security or a counterfeit security.

38. The method of Claims 31-35, or 36, wherein the security is currency.

39. The method of Claims 31-35, or 36, wherein (a) the substrate is a currency and (b) said method provides a mechanism in which to differentiate the currency by its bill denomination.

40. The method of Claims 31-35, or 36, wherein said method provides a mechanism in which to spectrally bar code items for non-contact identification purposes.

41. A method comprising the steps of:

a) providing a plurality of carbon nanotubes with unique, predetermined photoluminescence characteristics; and

b) incorporating the carbon nanotubes into articles as optical identifiers to form optically tagged articles.

42. The method of Claim 41 further comprising the steps of:

a) irradiating the optically tagged articles with EM radiation; and

b) detecting photoluminescence from the carbon nanotubes for the purpose of identifying the optically tagged article.

43. The method of Claim 42, wherein the step of irradiating utilizes a source that emits radiation in the visible region of the EM spectrum.

44. The method of Claim 42, wherein the step of irradiating utilizes a source that emits radiation selected from the group consisting of monochromatic radiation and polychromatic radiation.

45. The method of Claim 43, wherein the source is a laser.

46. The method of Claim 42, wherein the step of irradiating utilizes multiple discrete excitation wavelengths.

47. The method of Claims 41-45, or 46, wherein the photoluminescence is in the near infrared region of the EM spectrum.

48. The method of Claim 47, wherein the detecting photoluminescence comprises the use of a camera selected from the group consisting of an InGaAs camera, a Si camera, and combinations thereof.

49. The method of Claims 41-47, or 48, wherein the carbon nanotubes are selected from the group consisting of single-wall carbon nanotubes, multi-wall carbon nanotubes, double-wall carbon nanotubes, and combinations thereof.

50. The method of Claims 41-47, or 48, wherein the carbon nanotubes comprise single-wall carbon nanotubes.

51. The method of Claims 41-47, or 48, wherein the carbon nanotubes comprise nanotubes having diameters less than about 3 nm.

52. The method of Claims 49-50, or 51, wherein at least some of the carbon nanotubes have been chemically functionalized.

53. The method of Claims 49-51, or 52, wherein at least some of the carbon nanotubes have undergone a process to separate them based a characteristic selected from the group consisting of length, diameter, chirality, bandgap, and combinations thereof.

54. The method of Claims 49-52, or 53, wherein the plurality of carbon nanotubes is substantially homogeneous.

55. The method of Claims 49-52, or 53, wherein the photoluminescence of the carbon nanotubes is derived from a unique combination of carbon nanotubes of varying characteristic.

56. The method of Claims 49-54, or 55, wherein the step of incorporating comprises an attachment mechanism.

57. The method of Claims 49-55, or 56, wherein the articles being optically tagged are selected from the group consisting of currency, securities, documents, passports, pharmaceuticals, articles of manufacture, and combinations thereof.

58. The method of Claims 49-55, or 56, wherein the articles are being optically tagged for anti-counterfeiting purposes.

59. The method of Claims 49-55, or 56, wherein the articles are being optically tagged for anti-piracy purposes.

60. The method of Claims 49-55, or 56, wherein the articles are being optically tagged for inventory assessment purposes.

61. The method of Claims 49-55, or 56, wherein the articles are being optically tagged for quality control purposes.

62. A method comprising the steps of:

a) selecting an article comprising carbon nanotubes;

b) irradiating the article with EM radiation so as to effect photoluminescence from any semiconducting carbon nanotubes present; and

c) comparing the photoluminescence to photoluminescence characteristics of known carbon nanotube populations for purposes of identification.

63. The method of Claim 62, wherein the carbon nanotubes are operable for undergoing photoluminescence and yielding emission within a second pre-determined photoluminescence characteristic when irradiated with radiation from a region of the EM spectrum selected from the group consisting of visible, ultraviolet, and combinations thereof, and further comprising the steps of:

a) irradiating the article with a second EM radiation so as to effect a second photoluminescence from the carbon nanotubes, wherein the second EM radiation is different than the first EM radiation; and

b) comparing the second photoluminescence to the second pre-determined photoluminescence characteristics for purposes of identification.

64. The method of Claim 63, wherein the second EM radiation has different spectral characteristics than the first EM radiation.

65. The method of Claims 62-63, or 64, wherein the carbon nanotubes are selected from the group consisting of single-wall carbon nanotubes, multi-wall carbon nanotubes, double-wall carbon nanotubes, and combinations thereof.

66. The method of Claims 62-63, or 64, wherein at least some of the carbon nanotubes have been chemically functionalized.

67. The method of Claims 62-63, or 64, wherein the carbon nanotubes comprise single-wall carbon nanotubes.

68. The method of Claims 62-63, or 64, wherein the carbon nanotubes comprise nanotubes having diameters less than about 3 nm.

69. The method of Claims 62-67, or 68, wherein the steps of irradiating are done with EM radiation comprising wavelengths in a region of the EM spectrum selected from the group consisting of visible, ultraviolet, and combinations thereof.

70. The method of Claims 62-68, or 69, wherein the step of irradiating is done with radiation selected from the group consisting of polychromatic radiation, monochromatic radiation, and combinations thereof.

71. The method of Claims 62-68, or 69, wherein the step of irradiating is done with at least one laser source.

72. The method of Claims 62-70, or 71, wherein the photoluminescence comprises emission wavelengths in the near infrared region of the EM spectrum.

73. The method of Claims 62-70, or 71, wherein the step of comparing involves an analysis of the photoluminescence.

74. The method of Claim 73, wherein the analysis is quantitative.

75. The method of Claim 73, wherein the analysis is qualitative.